PD rate calibration
(in preparation of LEC)

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Q: can PinDiodes be used to monitor the loss of Au^{78} ions (after recombination from cooling)?

Two APEX sessions (total under 30 min.)

APEX I: May 20th, fill 19082 from 12:55 to 13:02

6 bunches at injection (10 GeV)

APEX IIa: June 3, fill 19148, 8:41 to 8:48 at 10 GeV

APEX IIb: same fill, 11:00-11:15, at 23.5 GeV

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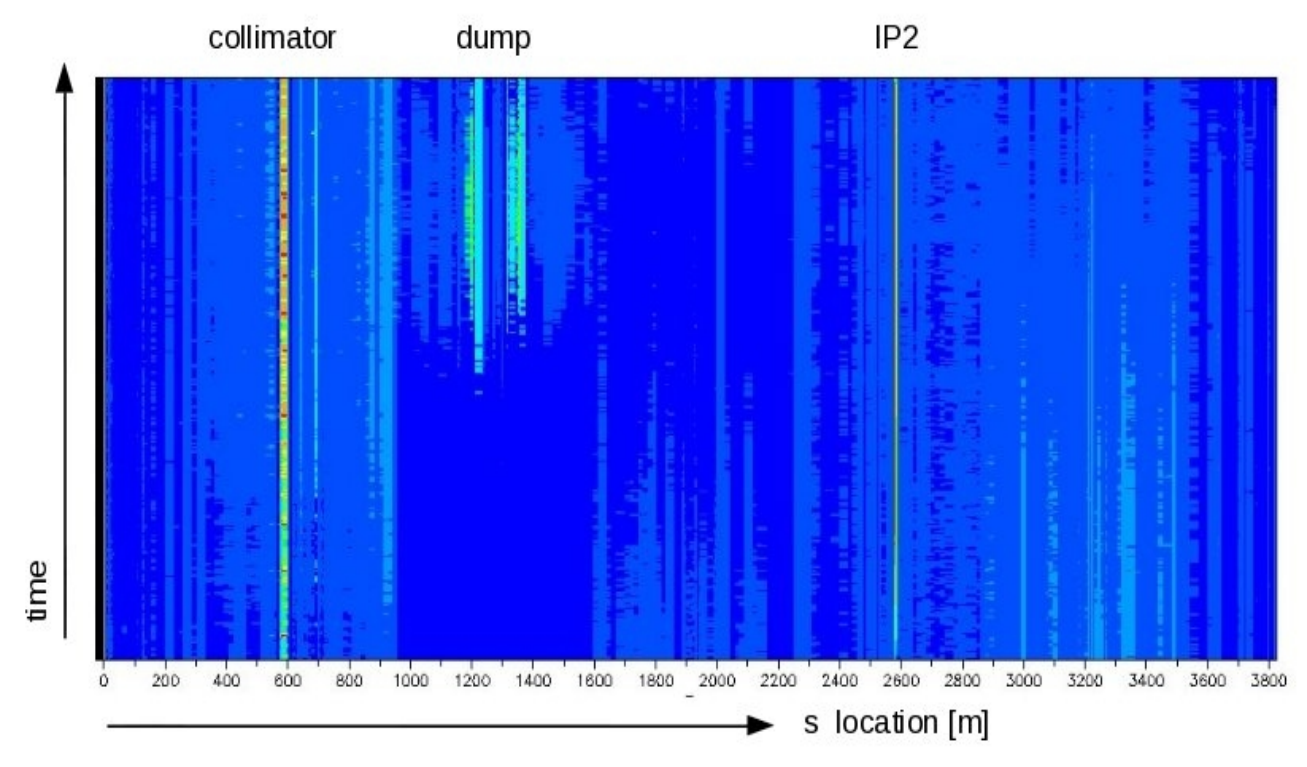
APEX I, Au beam at 10 GeV, excite individual bunches

Loss pattern during study:

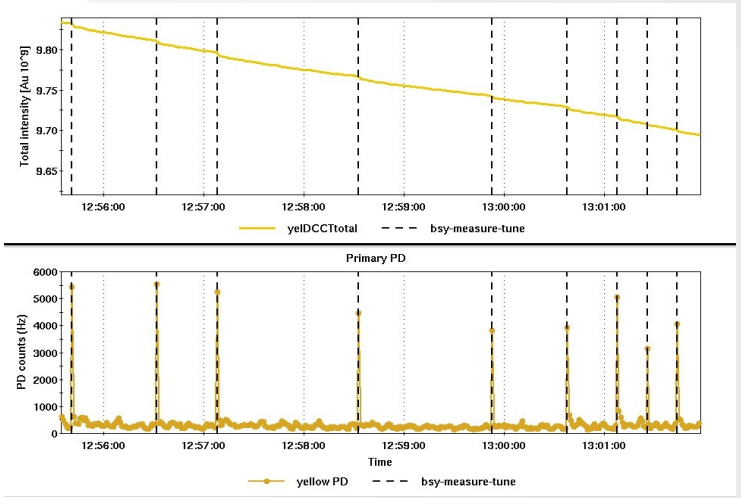


- Au beam with 6 bunches at injection
- Bring collimators in close to force losses in that area
- Excite one bunch at a time with ARTUS
- Measure response signal on collimator Pin Diodes

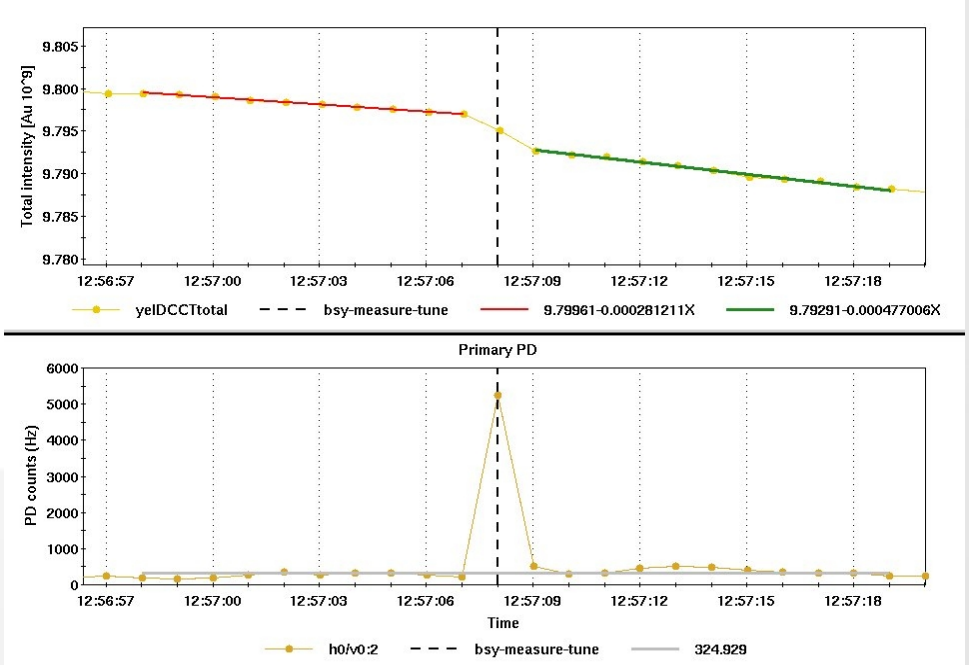
(Loss signal on PD constitutes an upper limit due to losses at dump and in IP2)

Calculate beam loss amount from DCCT data

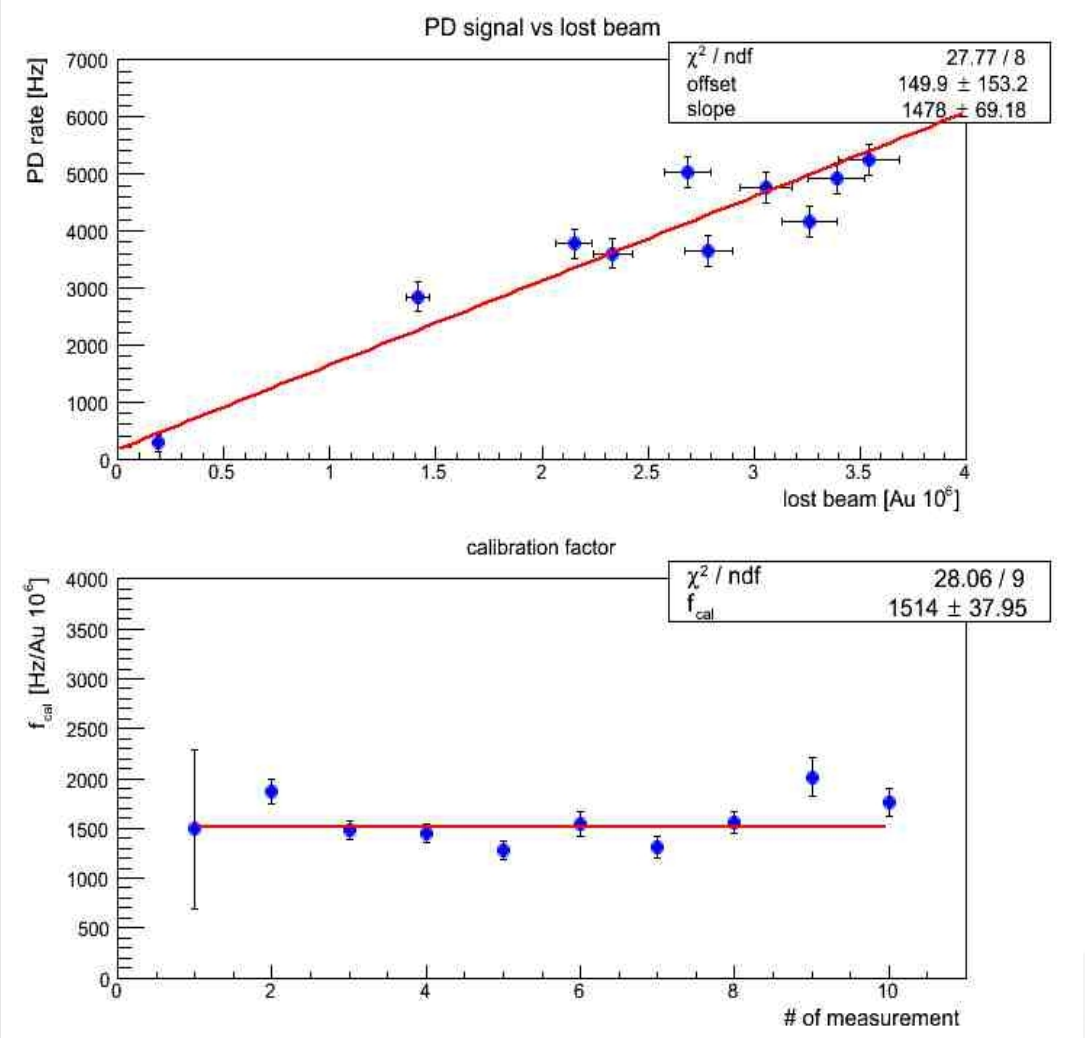
Dashed line = ARTUS trigger



- Fit slope with 10 data points before trigger
- Fit slope with 10 data points after trigger
- This should account for some of the continuous loss in other areas
- Extrapolate to time of trigger
- Difference at trigger time = amount of beam lost
- Get PD rate, subtract baseline during the 20 sec of measurements



Result APEX I



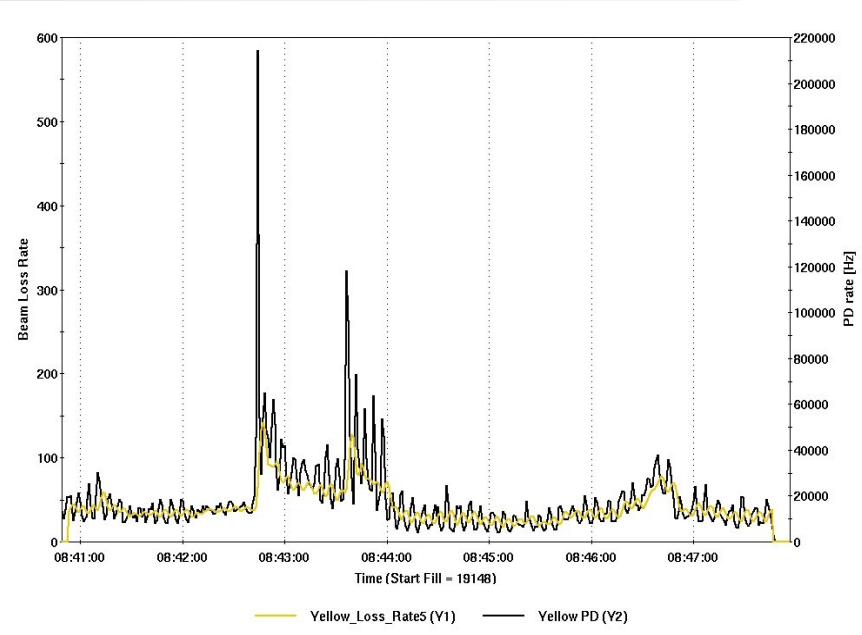
- 10 measurements (first is the continuous loss)
- Result:

f_{cal} = 1500 Hz/10^6 Au ions
+/- 170

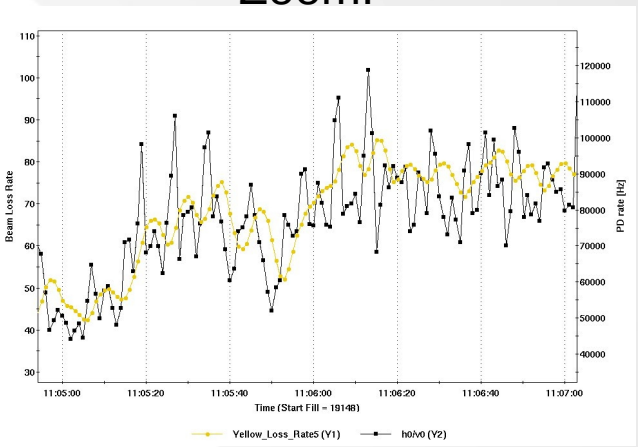
- Total beam loss vs integral PD rate yields 1150 cts/10^6 Au ions

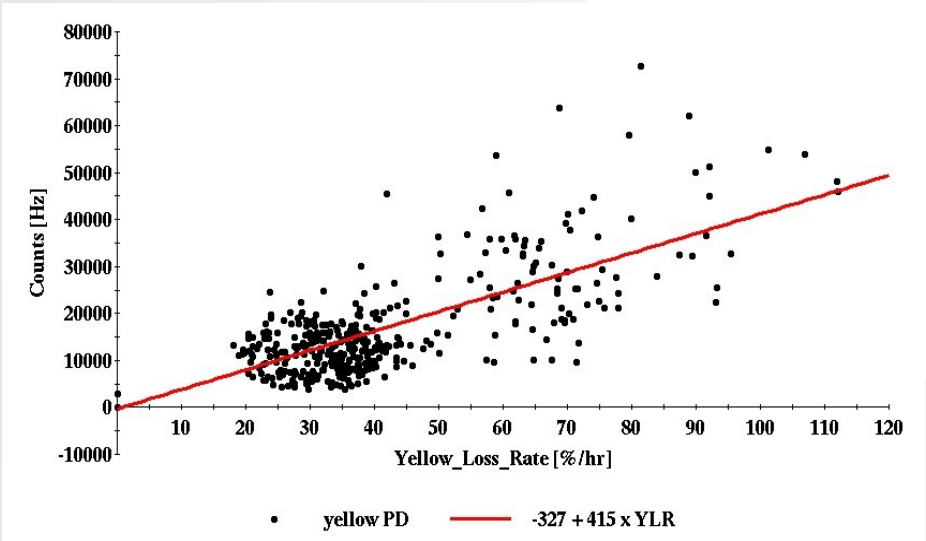
(or 1 out of 660 lost Au ions @ 10 GeV is detected by the PD)

APEX IIa, 10 GeV, 106 bunches



Zoom:



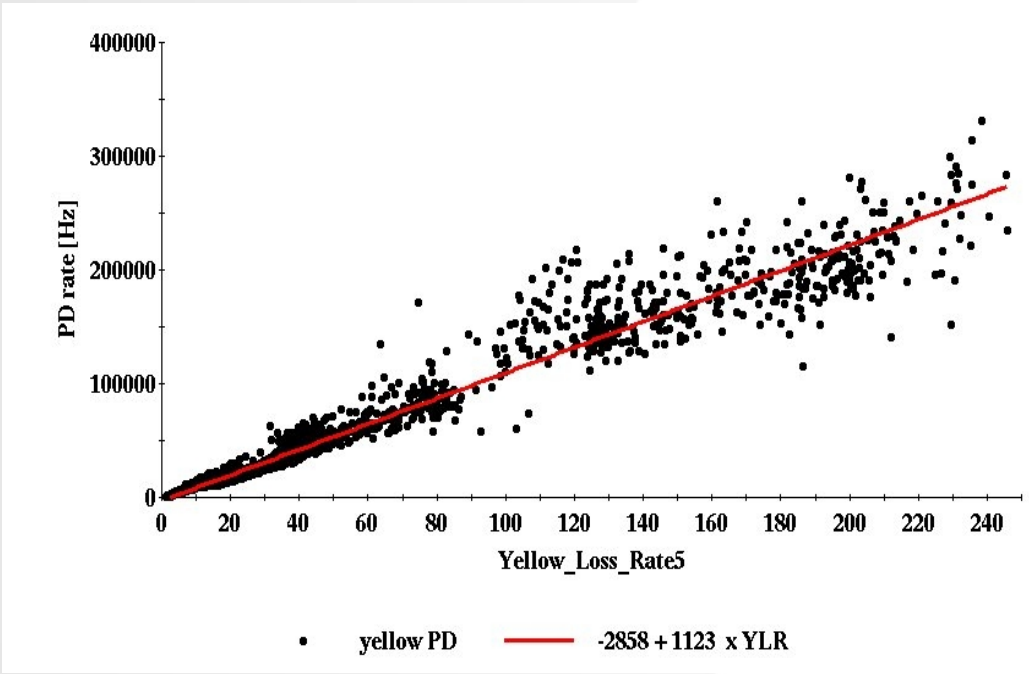


- No additional excitation
- Collimators in standard injection position
- Measure PD rate as a function of lifetime
- No time to provide a range of lifetimes
- Result:

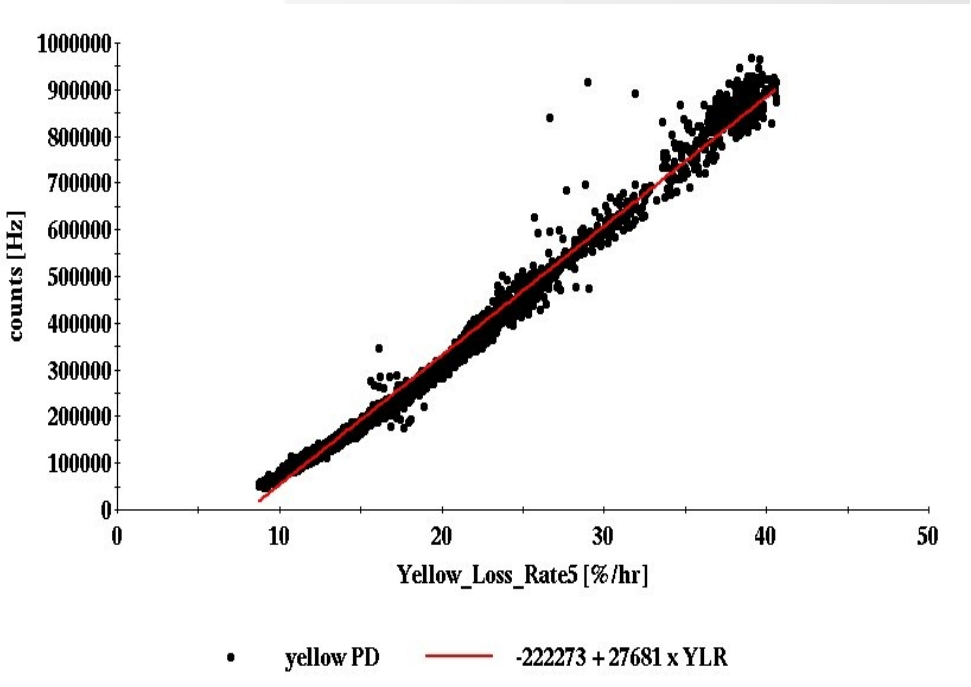
1 in 1075 Au ions detected

APEX IIb, 23.5 GeV

23.5 GeV



100 GeV
(later fill, sanity check)

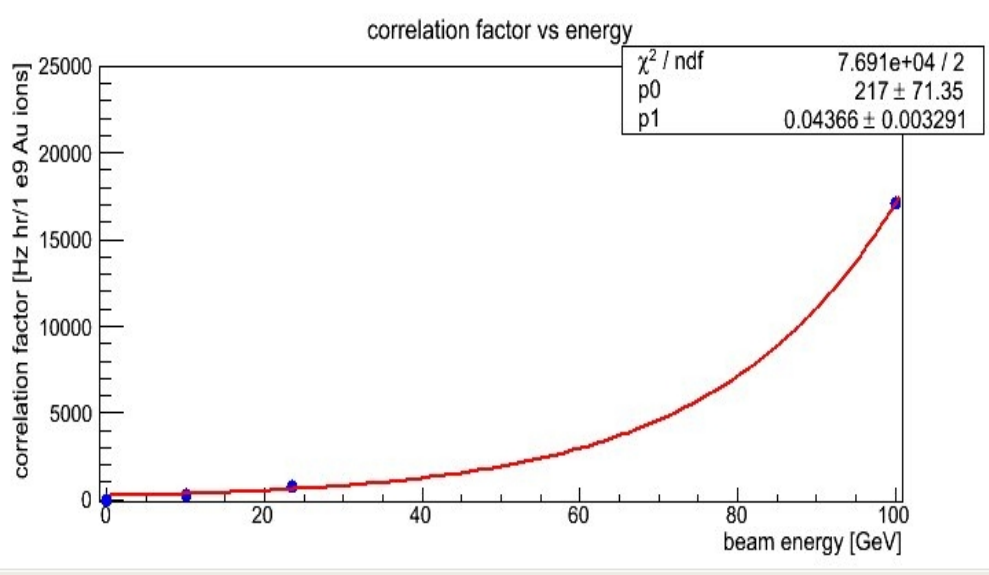


Correlation factor: 1120 @ 23.5 GeV

28,000 @ 100 GeV

Increase consistent with exponential growth of PD signal vs lifetime with energy

Sanity Check / Summary



Correlation factor (PD cts vs lifetime) as a fct. of energy.

Exponential dependency

Combine the results from 3 different methods (all at 10 GeV):

- 1500, 1140 and 930 per 1 Million Au ions detected
- Avg. of 1 detected out of 840 Au ions lost
- Collimator jaws were not optimized and slightly different